PATENT SPECIFICATION

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PROVISIONAL SPECIFICATION.

Improvements in and connected with Fuel Pumps for Internal Combustion Engines of the Diesel or Compression Ignition Type.

We, ALFRED WISEMAN LIMITED, a Company incorporated under the Laws of Great Britain, ALFRED WISEMAN, Governing Director of the said Company, a British subject, and WILLIAM SIMMONS, a British subject, all of 89, Glover Street, Birmingham, in the County of Warwick, do hereby declare the nature of this invention to be as follows:—

This invention comprises certain improvements in and connected with fuel pumps for internal combustion engines of the Diesel or compression ignition type, and relates more particularly to fuel pumps incorporating for each engine cylinder a pump element having two plungers driven by mechanism which reciprocates said plungers in an out-of-phase relationship by which certain technical advantages in the delivery of fuel are obtained, as described in prior Patent No. 351,112, wherein the moment and duration of injection may be varied by displacement of the operating mechanism in relation to the driving mechanism.

Due to manufacturing tolerances and limits and to the possibility of wear, and especially unequal wear, in the moving parts of such pumps, it is desirable to make provision by which the said and other variables may be accommodated and balanced to obtain and maintain the designed requirements.

Accordingly, our invention consists in a fuel pump element for Diesel or compression ignition engines incorporating two reciprocable plungers adapted to operate in an out-of-phase relationship: mechanism for so operating the two plungers: and provision for individual adjustment of each of the said plungers in its relation to the driving mechanism, said provision being supplementary or in addition to the main hand or governor device by which the running of the engine is regulated and controlled. Such adjustment is particularly useful in connection with the several pump elements associated with a multi-cylinder engine.

The aforesaid provision for adjustment may be located at any desired place in the operating mechanism; according to one arrangement it is situated in the vicinity of the joint connecting the members of a two-link assemblage which rests on the driving cam as to its one part, and is supported on the pump housing as to its other part. In another arrangement, the adjustment means are associated with an extension of the housing-supported link. Other positions may however be chosen. The part which carries the housing-supported link may function as a rock shaft under hand or governor control for varying the time and duration of fuel injection which control is usually applied to the plunger which first commences its delivery stroke and is therefore described as the "leading" plunger.

In one convenient embodiment of our invention, the operating mechanism may comprise a rotary cam: a pair of push-rods between said cam and the sliding guides on which seat tappet-wise, the adjacent ends of the fuel plungers: and a two-link assemblage for supporting the cam end of each push-rod. One of the two links pertaining to each assemblage is mounted at its lower end on a shaft which in the case of the following plunger may be fixed in the pump housing, and in the case of the leading plunger is journally supported in the housing so that it may function as a rock shaft under the influence of hand or governor control. Otherwise, this link does not move during the working of the pump.

The control link may be extended upwardly in the form of a yoke to embrace and pivotally connect with the adjacent end of the push-rod link which at its other extremity is hingedly attached to the relevant push-rod. Such pivotal connection forms an appropriate point at which means for adjustment may be introduced. It is desired for this adjustment, to displace the cam end of the push-rod, towards or away from the control link, that is, to vary either the effective position or length or both of the

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push-rod link. To this end, the said pivotal connection may include an eccentric conveniently incorporated in the form of a two-diameter pin the larger diameter of which is normally fixed in the boss of the push-rod link by contraction of said boss through the agency of a screw or screws; the boss is split to permit of the contractile movement, and the pin is extended to a point outside the link and provided with a polygonal head such as a square-section to receive a spanner or key by which the pin may be turned into the desired position of adjustment, after the locking screw has been released. Reverse movement of the screw clamps the pin firmly in position. A peripheral groove may be turned in the middle of the pin to accommodate the shank of the clamping screw, and a bush may be inserted in one of the upper bosses of the control link to encircle the shank of and locate the eccentric pin. We may use a slide adapted to move in a slot, with screw, worm or other adjusting means.

According to another embodiment of our invention, the provision for adjustment is disposed at the lower end of an extension of the control link which extension may be displaced towards or away from the driving cam by any suitable device. In the present instance, we utilise a screw thread arrangement which may comprise an eye with a threaded shank, a tapped rotatable bush journally mounted in the pump housing, and a locking nut which operates on the screwed exterior of the rotatable bush.

The control link extension is slotted or bifurcated to receive a slidable block which is coupled to the adjusting eye by means of a pin, so as to accommodate the up and down movement of the control link which takes place when the rock shaft turns under the influence of hand or governor control. Other expedients may however be substituted provided the desired effect is obtained.

To adjust the mutual pivot point of the two links, the locking nut is released, and the tapped bush turned in the pump housing by means of the screw driver slot or flat provided for this purpose; the eye and consequently the bifurcated extension of the control link is thereby advanced towards and retracted from the driving cam to the desired position. The upper end of the control link thus moves the cam end of the push-rod through the intermediary of the push-rod link, and provides the needed adjustment. The tapped and headed bush is then locked from rotation by means of the locking nut. This form of adjustment is operable from the exterior of the housing while the engine is running, if so desired. It may however be considered desirable to locate the adjustment means inside the housing, as in the first-described embodiment.

Our invention is particularly useful as an aid to manufacture since the volume of fuel delivered per working stroke of the pump may be minute and therefore small variations in the pump mechanism are greatly magnified in their effect on the satisfactory functioning of an engine to which fuel is being delivered: particularly is this the case where an engine has a plurality of cylinders which in themselves may have considerable variations which should be compensated or balanced if the possible standard of performance is to be attained.

Dated this 31st day of May, 1932.

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COMPLETE SPECIFICATION.

Improvements in and connected with Fuel Pumps for Internal Combustion Engines of the Diesel or Compression Ignition Type.

We, ALFRED WISEMAN LIMITED, a Company incorporated under the Laws of Great Britain, ALFRED WISEMAN, Governing Director of the said Company, a British subject, and WILLIAM SIMMONS, a British subject, all of 89, Glover Street, Birmingham, in the County of Warwick, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to fuel feed pumps for internal combustion engines of the Diesel or compression ignition type and more particularly fuel feed pumps incorporating for each engine cylinder a pump element having two plungers driven by mechanism adapted to reciprocate said plungers in an out-of-phase relationship by which certain technical advantages are obtained in the delivery of

fuel, as described for example in prior Patent No. 351,112 wherein the moment and duration of injection and the volume of fuel may be varied by displacement of certain control parts.

Due to manufacturing tolerances and limits and to eventual wear, especially unequal wear, in the moving parts of such pumps, it is desirable to make provision by which the said and other variables can be accommodated and balanced to obtain and maintain the designed requirements.

Accordingly, our invention consists in a fuel pump element for Diesel or compression ignition engines incorporating two reciprocable plungers, mechanism for reciprocating said plungers in an out-of-phase relationship, and provision for adjustment of the leading plunger in its relation to the driving mechanism, said provision being independent of and supplementary or in addition to main operator or governor operated device by which the running of the engine is regulated and controlled. Such adjustment may be applied also to the following plunger and is particularly useful in connection with the several pump elements associated with a multi-cylinder engine.

We are aware that it has been proposed to provide means for adjustment of one or both plungers in their relation to the driving mechanism as shown in prior Patents 361,970 and 351,112 but the present invention is distinguished therefrom by the provision of a double means of adjustment for the leading plunger or for each plunger, one relatively wide for regulating and controlling the normal working of the engine, and the other a fine means of adjustment for balancing as before described. Such separate and double means of adjustment for the leading plunger or for each plunger is the characteristic feature of the invention and we desire the appended claims to be construed as including such characteristics.

The aforesaid provision for adjustment may be located at any desired place in the mechanism; according to one arrangement it is situated in the vicinity of the joint connecting the members of a two-link assemblage which rests on the driving cam as to its one part, and is supported on the pump housing as to its other part. In one arrangement, the adjustment means are associated with an extension of the housing-supported link. Other positions may however be chosen. The part which carries the housing-supported link may function as a rock shaft under operator or governor control for varying the time and duration of fuel injection which control is usually applied to the plunger which first commences its delivery stroke and is therefore described as the "leading" plunger.

In order that this invention may be clearly understood and readily carried into practice, we have appended hereto two explanatory sheets of drawings in which:—

Figure 1 is a part sectional elevation illustrative of one embodiment in which the provision for adjustment is introduced into a joint of the transmission mechanism.

Fig. 2 is a part sectional end elevation of one of the links included in Figure 1.

Figure 3 is a part sectional elevation of an embodiment of a different type in which one of the transmission links is extended and adjustment and provision for adjustment applied to the extension.

In the embodiment of the invention shown in the drawings, the operating mechanism may comprise a rotary cam 1 Fig. 2, a pair of push-rods 2, 3 between said cam and the sliding guides 4, 5 on which seat tappet-wise, the adjacent ends of the fuel plungers 6, 7: and a two-link assemblage 8, 9 Fig. 1 for supporting the cam end of each push-rod. One of the two links pertaining to each assemblage is mounted at its lower end on a shaft 10, 11 which in the case of the following plunger 7 may be fixed in the pump housing 12, and in the case of the leading plunger is journally supported in the housing so that it may function as a rock shaft under the influence of operator or governor control. Otherwise, the link 9 does not move during the working of the pump.

The control link may be extended upwardly in the form of a yoke 13 Fig. 2 to embrace and pivotally connect with the adjacent end of the push-rod link 8 which at its other extremity is hingedly attached to the relevant push-rod 2. Such pivotal connection forms an appropriate point at which means for adjustment may be introduced. It is desired for this adjustment, to displace the cam end of the push-rod towards or away from the control link, that is, to vary either the effective position or the effective length or both, of the push-rod link. To this end the said pivotal connection may include an eccentric conveniently incorporated in the form of a two-diameter pin 14 the larger diameter of which is normally fixed in the boss of the push-rod link 8 by contraction of said boss through the agency of a screw 15 or screws; the boss 16 is split to permit of the contractile movement; and the pin 14 is extended to a point outside the link and provided with a polygonal head 17

such as a square-section to receive a spanner or key by which the pin may be turned into the desired position of adjustment, after the locking screw has been released. Reverse movement of the screw clamps the pin firmly in position. A peripheral groove 18 Fig. 2 may be turned in the middle of the pin to accommodate the shank of the clamping screw 15, and a bush 19 may be inserted in one of the upper bosses of the control link to encircle the shank of and locate the eccentric pin. As an alternative may be used a slide adapted to move in a slot, with screw, worm, or other adjusting means.

According to another group of embodiments of our invention a typical example of which is illustrated in Figure 3, the provision for adjustment is disposed at the lower end of an extension 20 of the control link, which extension may be displaced towards or away from the driving cam by any suitable device. In the present instance, we utilise a screw-thread arrangement which may comprise an eye 21 with a threaded shank 22, a tapped rotatable bush 23 journally mounted in the pump housing, and a locking nut 24 which operates on the screwed periphery of the rotatable bush 23.

The control link extension 20 is slotted or bifurcated to receive a slidable block 25 which is coupled to the adjusting eye 21 by means of a pin 26 so as to accommodate the up and down movement of the control link which takes place when the rock shaft turns under the influence of operator or governor control. Other devices may however be substituted provided the desired effect is obtained.

To adjust the mutual pivot point of the two links, the locking nut 24 is released, and the tapped bush 23 turned in the pump housing by means of the screwdriver slot 27 or flat provided for this purpose; the eye 21 and with it the bifurcated extension 20 of the control link is thereby advanced towards or retracted from the driving cam to the desired position. The upper end of the control link thus moves the cam end of the push-rod through the intermediary of the push-rod link, and provides the needed adjustment. The tapped and headed bush 23 is then locked from rotation by means of the locking nut 24.

This form of adjustment is operable from the exterior of the housing while the pump is working and therefore adjustments may be made during the running of the engine which the pump is feeding, if so desired.

In some constructions it may be deemed desirable to locate the adjustment means inside the housing as in the first-described group in which case the bush 23 is not extended to the exterior of the housing but together with its associated lock nut may be enclosed within the housing; or alternatively a cover fixed by screws may be applied to shroud the projecting parts and prevent access by unauthorised persons.

A fluid bridge 28 may couple together the two barrels in order that they may deliver to a common outlet 29 in a detachable outlet fitting 30.

Our invention is particularly useful as an aid to manufacture since the volume of fuel delivered per working stroke of the pump may be minute and therefore small variations in the pump mechanism are greatly magnified in their effect on the satisfactory functioning of an engine to which fuel is being delivered; particularly is this the case where an engine has a plurality of cylinders which in themselves may have considerable variations which should be compensated or balanced if the possible standard of performance is to be attained.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. A fuel pump for internal combustion engines of the Diesel or compression ignition type comprising for each engine cylinder a pump element having two plungers, mechanism for reciprocating said plungers in an out-of-phase relationship, operator or governor controlled means for regulating the normal working of the engine, and supplementary provision independent of said operator or governor controlled means for adjustment of the leading plunger in its relation to the driving mechanism.

2. A liquid fuel pump for Diesel or compression ignition engines comprising for each engine cylinder a pump element having two plungers, mechanism for reciprocating said plungers in an out-of-phase relationship, operator or governor operable means for regulating and controlling the normal working of the engine, and supplementary provision independent of said operator or governor operable means for adjustment of both said plungers in their relation to the driving mechanism.

3. A liquid fuel pump for Diesel or compression ignition engines comprising for each engine cylinder a pump element having two plungers, mechanism for reciprocating said plungers in an out-of-phase relationship, operator or governor operable means for regulating and controlling the normal working of the engine, and supplementary provision independent

of said operator or governor operable means and operable from the exterior of the pump housing for adjustment of the leading plunger or both plungers in its or their relation to the driving mechanism.

4. A liquid fuel pump for Diesel or compression ignition engines comprising for each engine cylinder a pump element having two plungers, mechanism for reciprocating said plungers in an out-of-phase relationship, operator or governor operable means for regulating and controlling the normal working of the engine, and supplementary provision independent of said operator or governor operable means and operable during the working of the pump for adjustment of both said plungers in their relation to the driving mechanism.

5. A liquid fuel pump for Diesel or compression ignition engines comprising for each engine cylinder a pump element having two plungers, mechanism for reciprocating said plungers in an out-of-phase relationship, operator or governor operable means for regulating and controlling the normal working of the engine, and adjustment provision independent of said operator or governor operable means and associated with the joint connecting members of the operating mechanism for varying the relative position of the driving cam and the plungers.

6. A liquid fuel pump for Diesel or compression ignition engines comprising for each engine cylinder a pump element having two plungers, mechanism for reciprocating said plungers in an out-of-phase relationship, operator or governor operable means for regulating and controlling the normal working of the engine, and adjustment provision independent of said operator or governor operable means and associated with an extension of one of the transmission links for varying the relative position of the driving cam and one or both of the said plungers.

7. A liquid fuel pump for Diesel or compression ignition engines comprising for each engine cylinder a pump element having two plungers, mechanism for reciprocating said plungers in an out-of-phase relationship, operator or governor operable means for regulating and controlling the normal working of the engine, and supplementary provision independent of said operator or governor operable means and including an eccentric pivot pin for adjustment of the leading plunger or both of said plungers in relation to the driving mechanism.

8. A liquid fuel pump for Diesel or compression ignition engines comprising for each engine cylinder a pump element having two plungers, mechanism for reciprocating said plungers in an out-of-phase relationship, operator or governor operable means for regulating and controlling the normal working of the engine, and supplementary means of adjustment independent of said operator or governor operable means including an adjustable abutment for locating one end of an extended link of the transmission mechanism for adjustment of the leading plunger or both of the said plungers in relation to the driving mechanism.

9. A pump according to Claim 7 in which the eccentric pivot pin is shaped at one part for enabling it to be turned for adjustment.

10. A liquid fuel pump for Diesel or compression ignition engines comprising for each engine cylinder a pump element having two plungers, mechanism for reciprocating said plungers in an out-of-phase relationship, operator or governor operable means for regulating and controlling the normal working of the engine, and adjustment provision independent of said operator or governor operable means and including an eccentric pivot pin, a contractile member in which said pin is mounted, and a screw adapted to contract said member on to the said pin, for adjustment of the relative position of the leading plunger or both plungers in relation to the driving cam.

11. A pump according to Claim 8 having screw means combined with the adjustable abutment.

12. A liquid fuel pump for Diesel or compression ignition engines comprising for each engine cylinder a pump element having two plungers, mechanism for reciprocating said plungers in an out-of-phase relationship, operator or governor operable means for regulating and controlling the normal working of the engine, and supplementary adjustment provision independent of said operator or governor operable means and including a link extension, a groove or slot therein, a pivoted block adapted to slide in said groove or slot, and a housing-supported adjustable part pivotally engaging said block.

13. Supplementary adjustment provision for a fuel pump substantially as described with reference to Figures 1 and 2 of the drawings.

14. Supplementary adjustment provision for a fuel pump substantially as described with reference to Figure 3 of the drawings.

15. A fuel pump for Diesel or compression ignition engines substantially as herein described and illustrated.

Dated this 29th day of August, 1932.

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Fig. 1.

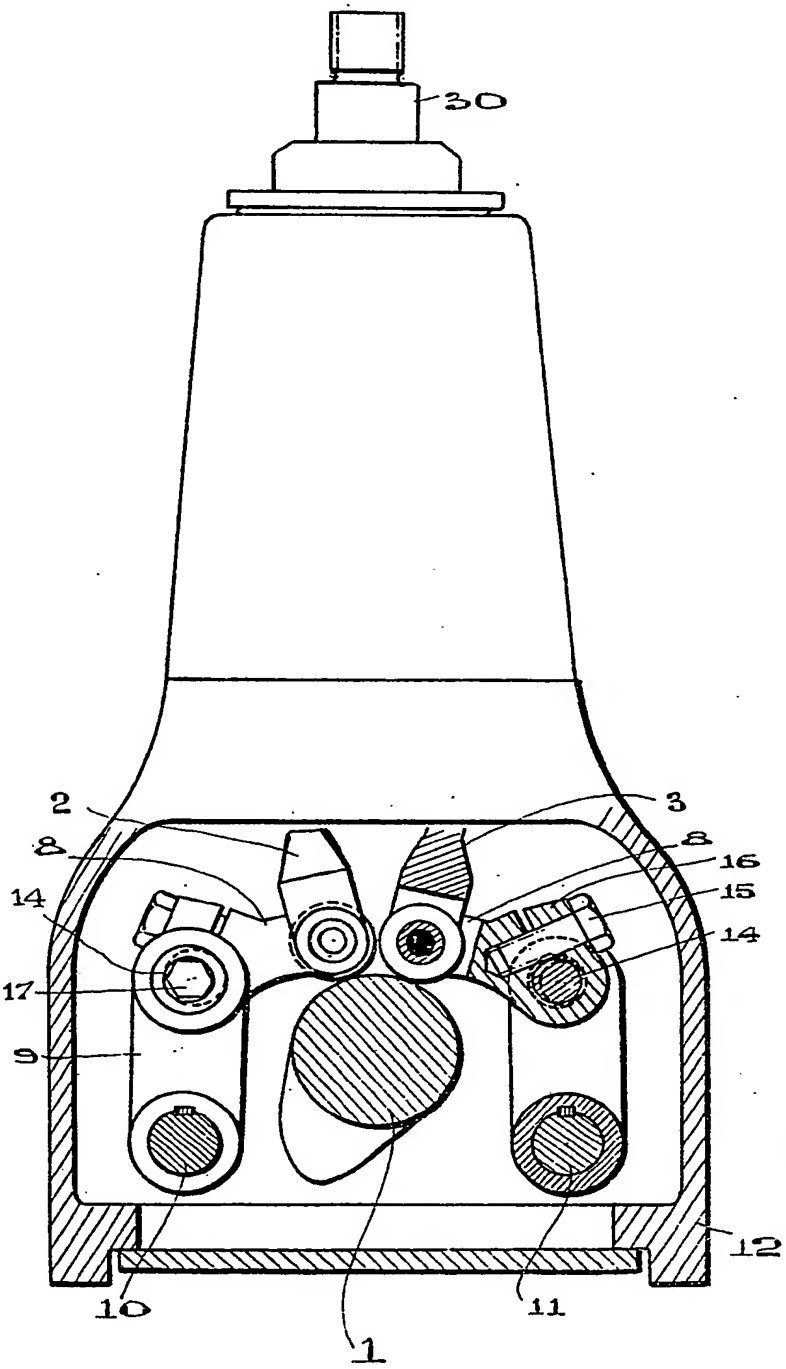
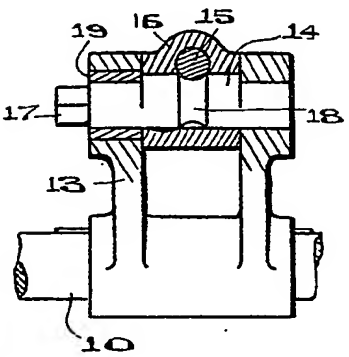
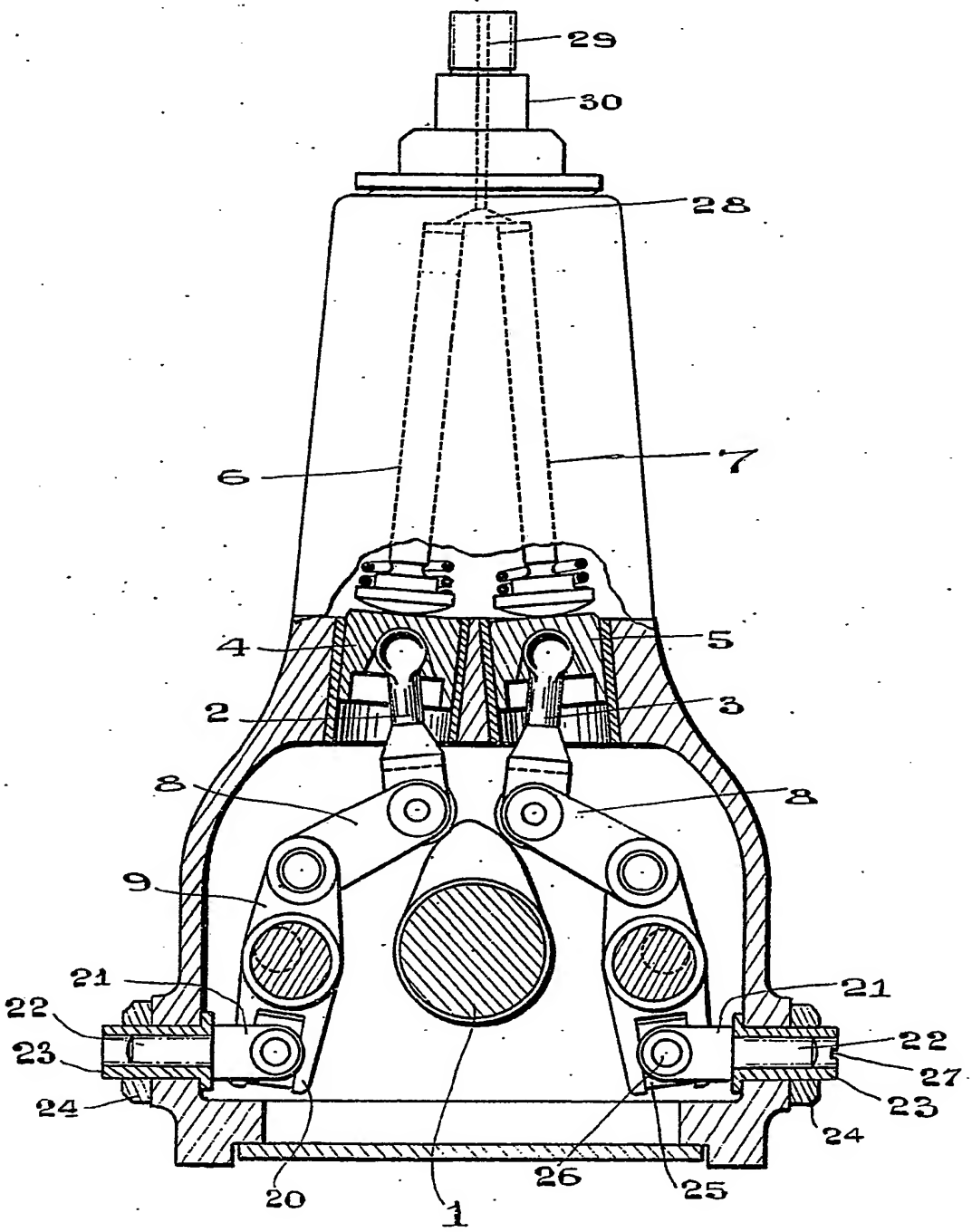


Fig. 2.



22
23
2

Fig. 3.



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390,668 COMPLETE SPECIFICATION

2 SHEETS
SHEET 1

Fig. 1.

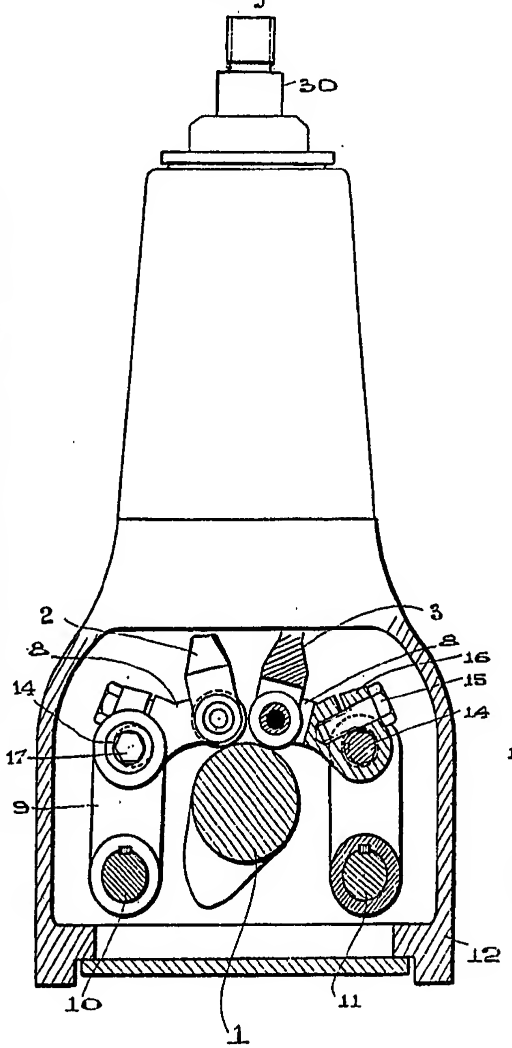
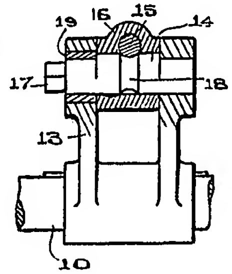
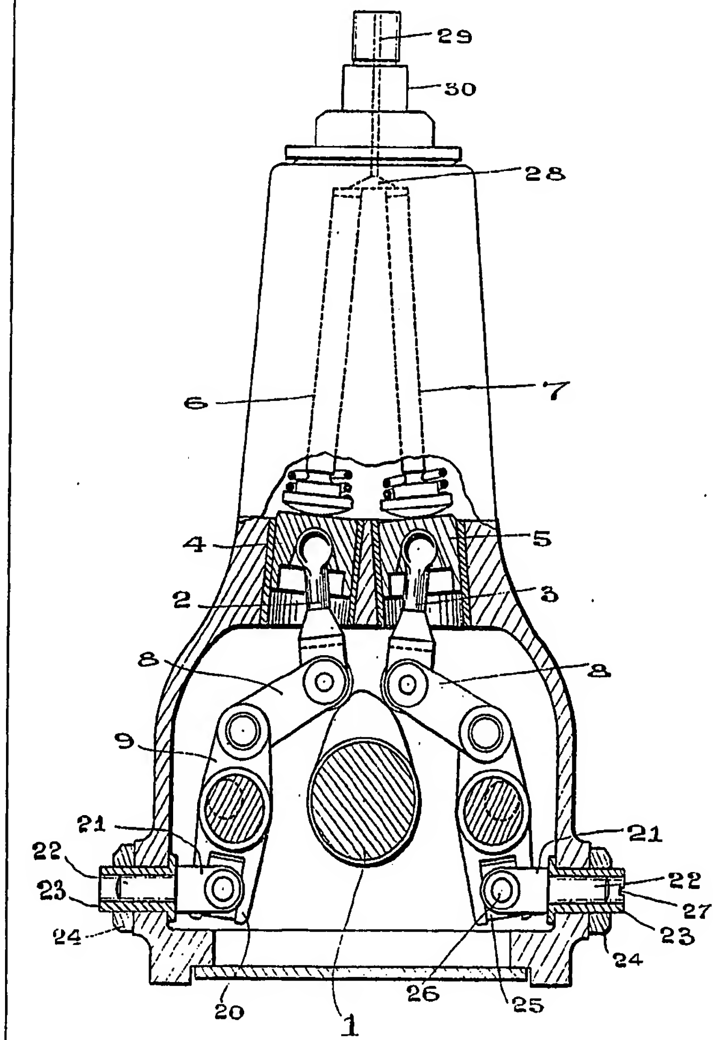


Fig. 2.



SHEET 2

Fig. 3.



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